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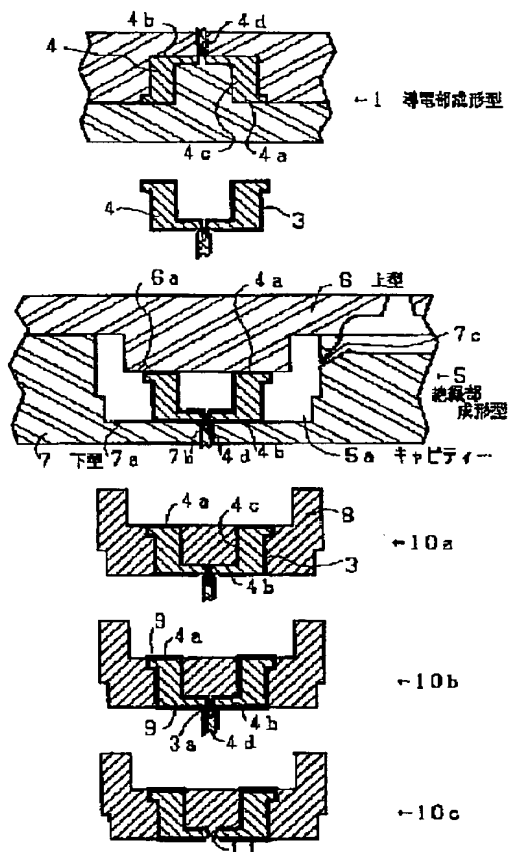
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TITLE : MANUFACTURE OF CIRCUIT BOARD



ABSTRACT : **PURPOSE:** To obtain a circuit board wherein a plurality of conductor circuits have been brought into close contact with, and united to, an insulating part firmly by a method wherein a primary-side circuit molded product which has been molded by executing a plating treatment to a thermoplastic resin is held inside a metal mold in a pressure contact state and a secondary-side insulating part is injection-molded by using an insulating resin.

CONSTITUTION: A common electrode part 4a in a primary-side circuit molded product 4 to which a plating treatment has been executed is inserted into, and positioned in, a central hole 7b in a lower mold 7 in a secondary-side insulation part; after that, a metal mold is fastened. A surface pattern 4a and a rear-surface pattern 4b are held in a state that they are brought into pressure contact with the surface 6a of an upper mold 6 and with the surface 7a of the lower mold 7; after that, a cavity 5a is filled with PPS (polyphenylene sulfide) as an insulating thermoplastic resin from a gate part 7c. The common electrode part 4d is fractured from a notch-shaped part at the base part 3a of the common electrode part 4d and it is removed. A plurality of independent conductors are formed. As a result, plated layers 3 are formed on the surface pattern 4a and the rear-surface pattern 4b, and a circuit board 10c in which a plurality of independent conductor circuits have been united can be obtained.

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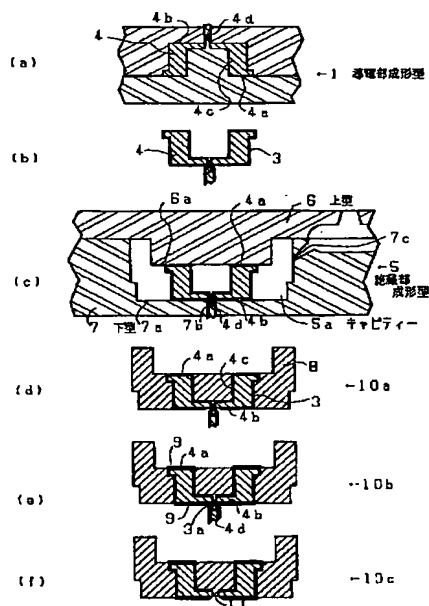
(54) 【発明の名称】 回路基板の製造方法

(57) 【要約】

【目的】 本発明は、密着性が良好でコストダウンの可能な回路基板の製造方法を提供する。

【構成】 熱可塑性樹脂を用いてゲート近傍を共通電極部4dとした一次側回路形成品4を成形し、前記一次側回路形成品4をメッキ処理した後、二次側絶縁部の成形型6、7に挿入し熱膨脹係数のほぼ等しい熱可塑性樹脂を用いて絶縁部8を成形して、導電体回路と絶縁部が一体となった回路基板10aを得る。前記回路基板10aの共通電極部4dを除去する事により、それぞれが独立した複数の導電体回路が一体化する。

【効果】 複数の導電体回路が絶縁部と強固に密着し一体化した回路基板が得られる。又、加工が容易となり量産性とコストダウンがはかれる。



【特許請求の範囲】

【請求項1】 樹脂にメッキ処理を施し導電性とした一次側回路形成品と樹脂を用いた二次側絶縁部を射出成形法で一体成形する回路基板の製造方法において、前記一次側回路形成品の上面および下面の少なくとも一部が二次側絶縁部の成形金型の固定側（上型）の表面と可動側（下型）の表面に圧接状態に保持して、二次側絶縁部を絶縁性の樹脂で射出成形することにより、上面と下面が導通し一体となった導電体回路を形成する工程と、前記導電体回路の共通電極部を除去してそれぞれ独立した複数の導電体回路とする事の特徴とする回路基板の製造方法。

【請求項2】 一次側回路形成品と二次側絶縁部の熱膨張係数がほぼ等しい熱可塑性樹脂を用いたことを特徴とする請求項1記載の回路基板の製造方法。

【請求項3】 一次側回路形成品と二次側絶縁部の熱可塑性樹脂がPPSであることを特徴とする請求項1記載の回路基板の製造方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、複合成形回路基板の製造方法に関する。

【0002】

【従来の技術】 従来の複合成形回路基板の製造方法では、基板の上下面にメッキにより形成された回路パターン間にスルーホールを設けて、このスルーホールの内周面のメッキ処理によって上下面が導通した導電体回路を形成している。

【0003】 また、特開平3-104614号公報に記載された複合成形回路基板の製造方法においては、回路形成用の凹部および穴部を有する絶縁性一次側形成品を絶縁性樹脂を用いて形成した後に、前記凹部および穴部に導電性樹脂を用いて二次成形をすることによって、基板の上下面に形成された回路パターンの必要部分が導通する複合成形回路基板の製造方法が開示されている。

【0004】

【発明が解決しようとする課題】 従来の複合成形回路基板の製造方法では、基板上下面の回路パターンはメッキ処理によりメッキ層を形成している。基板とメッキ層とは熱膨張係数が異なり温度変化による界面のズレが発生する。そのため、回路パターン（メッキ層）が剥離し易くなり信頼性の低下が著しく、品質上の問題となっていた。また、基板上面の回路パターンと下面の回路パターンを導通し導電体回路とする為にスルーホールを形成し、さらにその内周面にはメッキ処理を必要とするなど加工工程もなぐくなりコストアップの要因となっていた。

【0005】 また、特開平3-104614号公報に記載の複合成形回路基板の製造方法においては、一次側形成品に形成された絶縁部の凹部および穴部に、導電性樹

脂を用いた二次成形をすることによって導電体回路を形成している。二次成形された導電体回路部は、導電性樹脂の成形収縮によって絶縁部と導電体回路部の界面が剥離し易くなり、密着性が問題となっている。

【0006】 本発明は、前記問題点を解消し、加工工程も少なくコストダウンが可能であるとともに、絶縁部と導電体回路部の密着性の良好な回路基板の製造方法を提供することを目的としている。

【0007】

【課題を解決するための手段】 前記目的を達成するための本発明による回路基板の製造方法は、メッキ処理を施し導電性とした一次側回路形成品の上面および下面の少なくとも一部が、二次側絶縁部の成形金型の固定側（上型）の表面と可動側（下型）の表面に圧接状態に保持して二次側絶縁部を絶縁性樹脂で射出成形することにより、上面と下面が導通した導電体回路を形成する工程と、前記回路パターンの共通電極部を除去してそれぞれ独立した複数の導電体回路とすることを特徴としている。

【0008】 また、一次側回路形成品の熱可塑性樹脂と、二次側絶縁部の絶縁性熱可塑性樹脂の熱膨張係数がほぼ等しいことを特徴としている。

【0009】

【作用】 この回路基板の製造方法は、熱膨張係数がほぼ等しい熱可塑性樹脂と絶縁性熱可塑性樹脂のインサート成形方法によるものである。熱可塑性樹脂にメッキ処理を施して形成された一次側回路形成品を、金型内に圧接状態に保持して二次側絶縁部を絶縁性樹脂で射出成形するため、二次側絶縁部の成形収縮によって絶縁部と導電体回路部の界面は、強固に密着する。

【0010】 また、一次側回路形成品の熱可塑性樹脂と、二次側絶縁部の絶縁性熱可塑性樹脂の熱膨張係数はほぼ等しいので、温度変化に対しての安定性が向上し、品質良好な信頼度の高い回路基板が得られる。

【0011】

【実施例】 以下図面により本発明の実施例を詳述する。図1は、本発明の回路基板の製造工程を示す第一実施例である。一次側回路成形工程では、図1(a)の如く熱可塑性樹脂であるポリフェニレンサルファイド（以下PPSと略記）のメッキグレートを用いて、共通電極部4dより充填し上面パターン4a、下面パターン4b、及び上面パターン4aと下面パターン4bとの導通をとる柱形状4cを形成し、一次側回路形成品4が完了する。次に前期一次側回路形成品のメッキ処理に移行する。

【0012】 一次側回路形成品4の成形工程終了後、前記一次側回路形成品4の共通電極部4dをメッキ処理時の電極として用い、一次側回路形成品4の全体にメッキ処理を施して、上面パターン4aと下面パターン4b、及び柱形状4cにメッキ層3を形成する。これで図1(b)に示す如く、一次側回路形成品4は表面全体にメ

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ン17とIC18のアルミ電極部とを、金線18aによって導通した状態の複合回路の平面図を示している。図3(b)には、図3(a)で完成した複合回路の下面パターン21とベース基板20を導電性接着剤22で一体化した要部の断面図を表しており、IC18の上部はエポキシやシリコン等の封止樹脂19が充填されている。

【００２０】図４は、本発明による回路基板の製造工程における第二実施例を示している。第一実施例と同様に、熱可塑性樹脂で成形した一次回路形成品に、メッキ処理を施した後、ウレタンやエポキシ等の液状樹脂を用いてスプレー塗装またはディッピングなどのコーティング手段により、弾力性のある樹脂層３４が一次回路形成品の表面全体に形成される。

【００２１】一次側回路形成品に弾力性のある樹脂層３４を形成後、二次側絶縁部３２の成形工程及び共通電極のカット工程までを第一実施例の図１（ｃ）～（ｅ）と同様に行う。以上の工程により、メッキ処理面が樹脂層３４で保護された上面パターン３１ａ及び下面パターン３１ｂの必要部分が導通し、各パターンが独立した配線をする複数の導電体回路が一体となった回路基板３５を得る事が出来る。

【0022】また、本発明に用いる熱可塑性樹脂は、熱膨脹係数がほぼ等しければPPS以外でも良い事は勿論、一次側回路形成品と二次側絶縁部に材質の異なる熱可塑性樹脂の使用も可能である。

[0023]

【発明の効果】上記のように本発明による回路基板は、上面パターンと下面パターンの必要部分が導通した導電体回路は、インサート成形方法で形成された二次側絶縁部の成形収縮によって絶縁部と導電体回路部の界面は、強固に密着している。また、前記導電体回路を形成する熱可塑性樹脂と前記絶縁部を形成する熱可塑性樹脂の熱膨張係数はほぼ等しいので温度変化に対しても密着状態は安定し、回路基板の信頼性は高い。

【0024】更に、熱可塑性樹脂によって形成された一次側回路形成品は、中央部分に配置されたゲートとゲートを含む共通電極部がありゲートを電極としてのメッキ処理によって、上面パターンと下面パターンの必要部分に容易にメッキ層を形成することが出来る。また、共通電極部が下面パターンの中央部近傍にまとまっているので、パターンカットにより中央部近傍を除去するだけで、それぞれが独立した導電体回路を容易に形成出来るなど、量産性やコスト削減に対しての効果は大きい。

【0025】その他、一次側回路形成品4のメッキ層3の表面に弾力性のある樹脂層34を設ける事によって、二次側絶縁部8の成形時に、上面パターン4aと下面パターン4bのメッキ層3が保護出来ると共に、二次側絶縁部8の成形収縮時には、一次側回路形成品4と二次側絶縁部8の界面に発生する歪みを樹脂層34の弾力性で吸収し、密着性やシール性が向上するなど多大の効果が

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ある。

【図面の簡単な説明】

【図1】本発明の第一実施例である回路基板製造方法を示す工程図である。

【図2】本発明の第一実施例の回路基板を用いた複合回路の平面図である。

【図3】本発明の第一実施例の回路基板を用いた多層に構成した複合回路応用例である。

【図4】本発明の第二実施例である回路基板製造方法を示す工程図である。

【符号の説明】

3 メッキ層

4 一次側回路形成品

4 a 上面パターン

4 b 下面パターン

4 c 柱状部

4 d 共通電極部

5 絶縁部成形型

6 上型

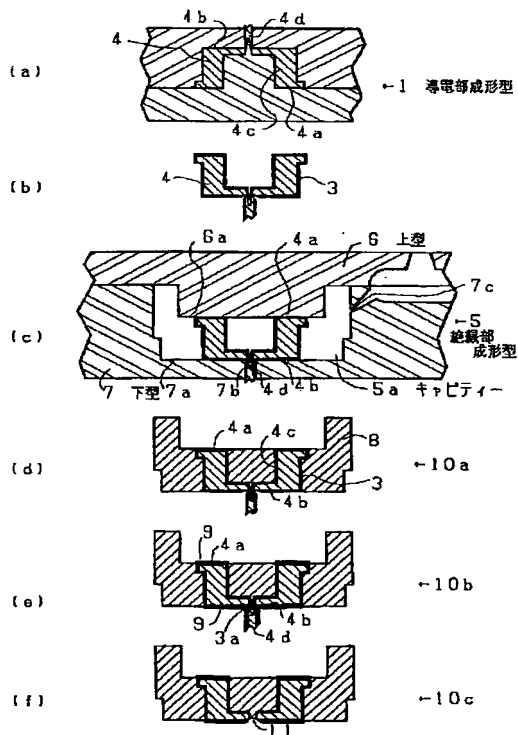
7 下型

8 二次側絶縁部

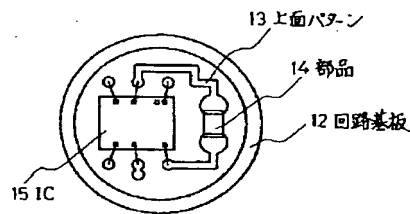
10 9 メッキ層

10 回路基板

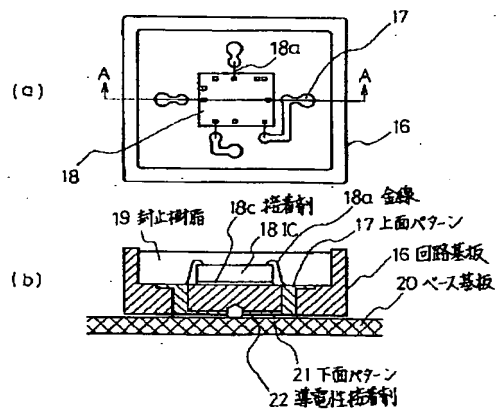
【図1】



【図2】



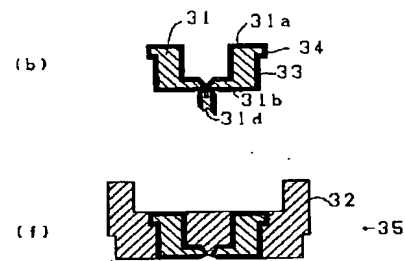
【図3】



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【図4】



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the manufacture method of the composite molding circuit board.

[0002]

[Description of the Prior Art] By the manufacture method of the conventional composite molding circuit board, a through hole is prepared between the circuit patterns formed in the vertical side of a substrate of plating, and the conductor circuit through which the vertical side flowed by plating processing of the inner skin of this through hole is formed.

[0003] Moreover, in the manufacture method of the composite molding circuit board indicated by the publication-number 3-No. 104614 official report, after forming the insulating upstream mold goods which have the crevice and hole for circuit formation using an insulating resin, the manufacture method of the composite molding circuit board through which the required portion of the circuit pattern formed in the vertical side of a substrate flows is indicated by using conductive resin for the aforementioned crevice and a hole, and carrying out secondary forming.

[0004]

[Problem(s) to be Solved by the Invention] By the manufacture method of the conventional composite molding circuit board, the circuit pattern of a substrate vertical side forms the deposit by plating processing. Coefficients of thermal expansion differ and gap of the interface by the temperature change generates a substrate and a deposit. therefore, a circuit pattern (deposit) -- exfoliating -- being easy -- the fall of reliability was remarkable and had become a problem on quality moreover, processing, such as forming a through hole, in order to flow through the circuit pattern on the upper surface of a substrate, and a circuit pattern at the bottom and to consider as a conductor circuit, and needing plating processing for the inner skin further, -- a process -- it had become the factor of the cost rise by the calyx

[0005] Moreover, in the manufacture method of the composite molding circuit board given in a publication-number 3-No. 104614 official report, the conductor circuit is formed by carrying out secondary forming which used conductive resin for the crevice and hole of the insulating section which were formed in upstream mold goods. According to the die shrinkage of conductive resin, the interface of the

insulating section and the conductor circuit section becomes easy to exfoliate, and, as for the conductor circuit section by which secondary forming was carried out, adhesion poses a problem.

[0006] this invention aims at offering the manufacture method of the circuit board with the good adhesion of the insulating section and the conductor circuit section while it can cancel the aforementioned trouble and can also cut down the cost of a processing process few.

[0007]

[Means for Solving the Problem] The manufacture method of the circuit board by this invention for attaining the aforementioned purpose A part of upper surface of the upstream circuit formation article which performed plating processing and was made into conductivity, and inferior surface of tongue [at least] fabrication of the secondary insulation section -- by holding in the pressure-welding state to the front face of the fixed side (punch) of metal mold, and the front face of a movable side (female mold), and carrying out injection molding of the secondary insulation section by the insulating resin It is characterized by the process which forms the conductor circuit through which the upper surface and the inferior surface of tongue flowed, and considering as two or more conductor circuits which removed the common polar zone of the aforementioned circuit pattern, and became independent, respectively.

[0008] Moreover, the coefficient of thermal expansion of the thermoplastics of an upstream circuit formation article and the insulating thermoplastics of the secondary insulation section is characterized by the almost equal thing.

[0009]

[Function] A coefficient of thermal expansion depends the manufacture method of this circuit board on the insert molding method of almost equal thermoplastics and insulating thermoplastics. the upstream circuit formation article fabricated by thermoplastics by performing plating processing -- metal mold -- in order to hold in the pressure-welding state and to carry out injection molding of the secondary insulation section by the insulating resin inside, the interface of the insulating section and the conductor circuit section is firmly stuck according to the die shrinkage of the secondary insulation section

[0010] Moreover, since the coefficient of thermal expansion of the thermoplastics of an upstream circuit formation article and the insulating thermoplastics of the secondary insulation section is almost equal, the stability over a temperature change improves and the circuit board with high reliability with good quality is obtained.

[0011]

[Example] The example of this invention is explained in full detail with a drawing below. Drawing 1 is the first example which shows the manufacturing process of the circuit board of this invention. Plaster-like 4c which fills up with an upstream circuit forming cycle from 4d of common polar zone using MEKKIGURETO of the polyphenylene sulfide (Following PPS and brief sketch) which is thermoplastics like drawing 1 (a), and takes a flow with upper surface pattern 4a, inferior-surface-of-tongue pattern 4b, and upper surface pattern 4a and inferior-surface-of-tongue pattern 4b is formed, and the upstream circuit formation article 4 is completed. Next, it shifts to plating processing of an upstream circuit formation article in the first half.

[0012] After the forming-cycle end of the upstream circuit formation article 4, using 4d of common polar zone of the aforementioned upstream circuit formation article 4 as an electrode at the time of plating processing, plating processing is performed to

the whole upstream circuit formation article 4, and a deposit 3 is formed in upper surface pattern 4a, inferior-surface-of-tongue pattern 4b, and pilaster-like 4c. As now shows to drawing 1 (b), a deposit 3 is formed in the whole front face, and the upstream circuit formation article 4 serves as a conductor. Next, it shifts to the forming cycle of the secondary insulation section.

[0013] Drawing 1 (c) explains the forming cycle of the secondary insulation section. first, to the whole, 4d of common polar zone of the upstream circuit formation article 4 by which plating processing was carried out was inserted in hole 7b of the center in the female mold (movable side) 7 of the form block 5 of the secondary insulation section 8, and it was positioned -- it carries out [after mold-clamp] After holding upper surface pattern 4a and inferior-surface-of-tongue pattern 4b in the pressure-welding state at surface 6a of a punch (fixed side) 6, and surface 7a of female mold (movable side) 7, mold cavity 5a is filled up with PPS which is insulating thermoplastics from gate section 7c.

[0014] As now shows to drawing 1 (d), circuit board 10a with which the upstream circuit formation article 4 and the secondary insulation section 8 were united through the deposit 3 is fabricated, and fabrication of the conductor circuit where upper surface pattern 4a and inferior-surface-of-tongue pattern 4b flowed and were united with the deposit 3 of the shape of a pilaster 4 is completed.

[0015] Furthermore, ***** plates to upper surface pattern 4a and inferior-surface-of-tongue pattern 4b of circuit board 10a, using again 4d of common polar zone of the upstream circuit formation article 4 as an electrode at the time of plating processing, as the pattern of a vertical side is shown after the forming-cycle end of the secondary insulation section 8 at drawing 1 (e), and it forms the new deposit 9 in the need at upper surface pattern 4a and inferior-surface-of-tongue pattern 4b. All patterns flow now and circuit board 10b by which the new deposit 9 was formed in the front face of a conductor circuit is obtained.

[0016] Circuit board 10a forms the conductor circuit which all the patterns flowed by 4d of common polar zone, and was united. And the point of the secondary insulation section 8 has entered the interior of the 4d of the aforementioned common polar zone. Moreover, since current density becomes lower than other portions at the time of plating processing as for base of 4d of common polar zone 3a, a deposit 3 becomes thin and becomes notch-like.

[0017] Drawing 1 (f) shows the state where 4d of common polar zone of a circuit pattern was removed. Only by bending in a longitudinal direction and applying some force, after taking out from having equipped the plating fixture and a fixture freely, it fractures from the portion of the shape of a notch of 4d of common polar zone of base 3a, and becomes a crevice 11, and 4d of common polar zone disappears, and two or more independent conductor circuits are formed. Consequently, as shown in drawing 1 (f), a deposit 3 or the new deposit 9 is formed in upper surface pattern 4a and inferior-surface-of-tongue pattern 4b, and circuit board 10c which unified two or more conductor circuits which the upper surface and the inferior-surface-of-tongue pattern of the required section flowed, and became independent; respectively is obtained.

[0018] After carrying parts 14 in the circuit board 12 manufactured using this invention, the example which pasted up IC15 near the center section of the aforementioned circuit board 12, flowed through the required portion by the gold streak, and constituted the compound circuit is the plan of drawing 2 .

[0019] moreover, the upper surface pattern 17 after drawing 3 shows other applications and drawing 3 (a) carries out adhesion fixation of IC18 by adhesives 18c at a part for the center section of the circuit board 16 by this invention and the aluminum polar zone of IC18 -- a gold streak -- the plan of the compound circuit in the state where it flowed by 18a is shown The cross section of the important section which unified the inferior-surface-of-tongue pattern 21 and the base substrate 20 of the compound circuit completed by drawing 3 (a) by the electroconductive glue 22 is expressed to drawing 3 (b), and, as for the upper part of IC18, it fills up with the closure resins 19, such as epoxy and silicon.

[0020] Drawing 4 shows the second example in the manufacturing process of the circuit board by this invention. The resin layer 34 which is elastic in it like the first example with coating meanses, such as spray painting or dipping, using liquefied resins, such as urethane and epoxy, after performing plating processing to the primary-circuit formation article fabricated by thermoplastics is formed in the whole front face of a primary-circuit formation article.

[0021] Even the forming cycle of the secondary insulation section 32 and the cut process of a common electrode are performed like drawing 1 [of the first example] (c) - (e) after forming the resin layer 34 it is [an upstream circuit formation article] elastic. According to the above process, the required portions of upper surface pattern 31a from which the plating processing side was protected in the resin layer 34, and inferior-surface-of-tongue pattern 31b flow, and the circuit board 35 with which two or more conductor circuits which have the wiring with which each pattern became independent were united can be obtained.

[0022] Moreover, use of the thermoplastics from which the quality of the material differs in an upstream circuit formation article and the secondary insulation section is also possible for the thermoplastics used for this invention as well as except PPS being sufficient as a coefficient of thermal expansion, as long as **** etc. is damp.

[0023]

[Effect of the Invention] The interface of the insulating section and the conductor circuit section is firmly stuck according to the die shrinkage of the secondary insulation section in which the conductor circuit where the required portions of an upper surface pattern and an inferior-surface-of-tongue pattern flowed through the circuit board by this invention as mentioned above was formed by the insert molding method. Moreover, since the coefficient of thermal expansion of the thermoplastics which forms the aforementioned conductor circuit, and the thermoplastics which forms the aforementioned insulating section is almost equal, an adhesion state is stabilized also to a temperature change, and the reliability of the circuit board is high.

[0024] Furthermore, the common polar zone including the gate arranged at a part for a center section and the gate has the upstream circuit formation article formed of thermoplastics, and it can form a deposit in the required portions of an upper surface pattern and an inferior-surface-of-tongue pattern for the gate easily by plating processing as an electrode. Moreover, since the common polar zone is collected near the center section of the inferior-surface-of-tongue pattern, as for the effect over mass-production nature or cost reduction, it is large that the conductor circuit where each became independent can be easily formed only by a pattern cut removing near the center section etc.

[0025] In addition, while being able to protect the deposit 3 of upper surface pattern

4a and inferior-surface-of-tongue pattern 4b at the time of fabrication of the secondary insulation section 8 by forming the elastic resin layer 34 in the front face of the deposit 3 of the upstream circuit formation article 4 At the time of the die shrinkage of the secondary insulation section 8, distortion generated in the interface of the upstream circuit formation article 4 and the secondary insulation section 8 is absorbed for the elasticity of the resin layer 34, and there are great effects -- adhesion and seal nature improve.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is process drawing showing the circuit board manufacture method which is the first example of this invention.

[Drawing 2] It is the plan of a compound circuit using the circuit board of the first example of this invention.

[Drawing 3] It is the compound circuit application constituted in the multilayer using the circuit board of the first example of this invention.

[Drawing 4] It is process drawing showing the circuit board manufacture method which is the second example of this invention.

[Description of Notations]

3 Deposit

4 Upstream Circuit Formation Article

4a Upper surface pattern

4b Inferior-surface-of-tongue pattern

4c Pillar-shaped section

4d Common polar zone

5 Insulating Section Form Block

6 Punch

7 Female Mold

8 Secondary Insulation Section

9 Deposit

10 Circuit Board

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CLAIMS

[Claim(s)]

[Claim 1] In the manufacture method of the circuit board which really fabricates the secondary insulation section using the upstream circuit formation article and resin which performed plating processing to the resin and were made into conductivity by the injection-molding method a part of upper surface of the aforementioned upstream circuit formation article, and inferior surface of tongue [at least] -- fabrication of the secondary insulation section -- by holding in the pressure-welding state to the front face of the fixed side (punch) of metal mold, and the front face of a movable side (female mold), and carrying out injection molding of the secondary insulation section by the insulating resin The manufacture method of the circuit board characterized by the process which forms the conductor circuit where the upper surface and the inferior surface of tongue flowed and were united, and considering as two or more conductor circuits which removed the common polar zone of the aforementioned conductor circuit, and became independent, respectively.

[Claim 2] The manufacture method of the circuit board according to claim 1 that the coefficient of thermal expansion of an upstream circuit formation article and the secondary insulation section is characterized by using almost equal thermoplastics.

[Claim 3] The manufacture method of the circuit board according to claim 1 characterized by the thermoplastics of an upstream circuit formation article and the secondary insulation section being PPS.

[Translation done.]